BM/d biomedical diagnostics

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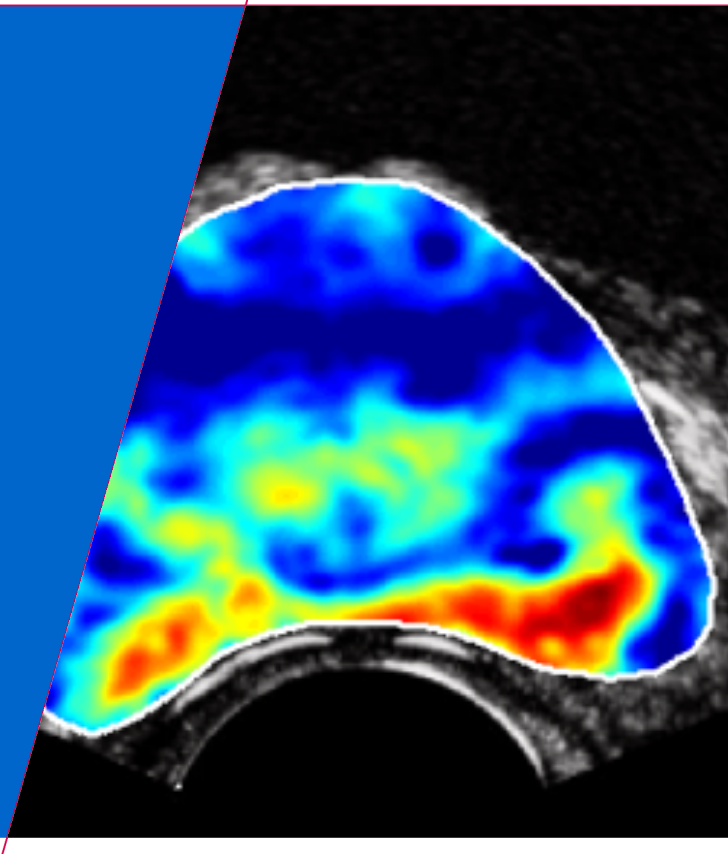
Signal Processing Systems

BioMedical Diagnostics BM/d

XPM May 9, 2018



TU/e Technische Universiteit Eindhoven University of Technology

Where innovation starts

Research focus

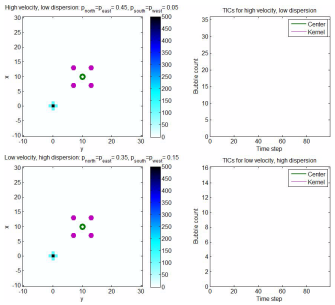
Model-based biomedical signal analysis

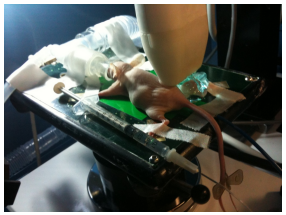
Hypothesis → simulations → *in-vitro* testing → *in-vivo* feasibility → *in-vivo* validation

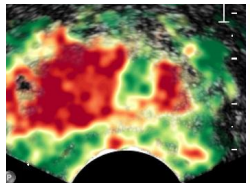
Model	Algorithm for signal analysis	Optimization in controlled conditions (also *ex vivo*)	Adjusted model and algorithm	Statistical validation
Convective dispersion of UCAs	Moving Gaussian distribution	Setup with tubing	Pilot tests in patients or animals	Clinical study, comparison vs. ground truth

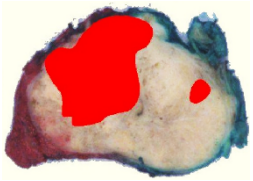
$$\partial_t C = \nabla \cdot \boldsymbol{D} \nabla C - \vec{v} \cdot \nabla C$$

$$C(t) = \alpha \sqrt{\frac{\kappa}{2\pi t}} \exp\left(-\frac{\kappa}{2t}(t-\mu)^2\right)$$







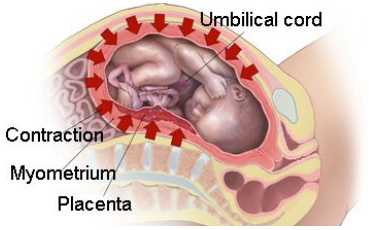


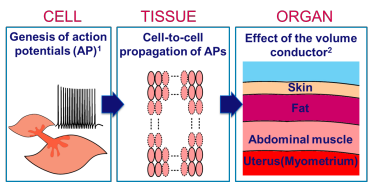
Research focus

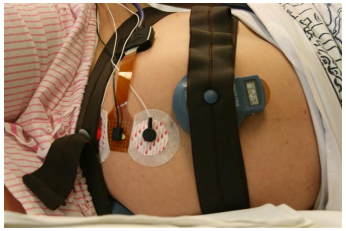
Full measurement chain (Improving and modeling each step)

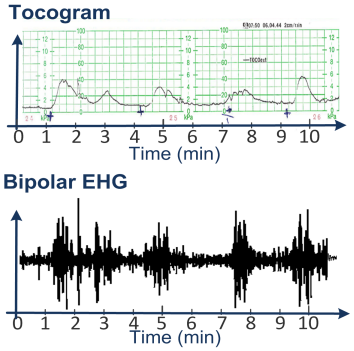
Source → Sensing/acquisition → pre-processing → analysis → validation

Uterus (multiple scales)	Electrode, amplifier, configuration	Signal and noise models	Model-based features, optimal estimator/classifier	Clinical protocol and statistics







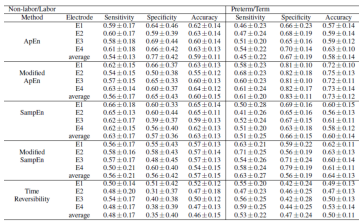


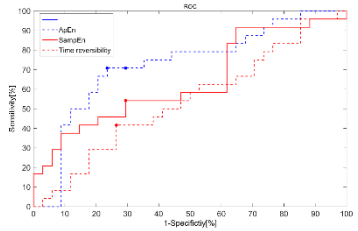
$$C_i^m(r) = \frac{B_i}{N-m+1}$$

$$\Phi_m^N(r) = \frac{\sum_{i=1}^{N-m+1} \ln[C_i^m(r)]}{N-m+1}$$

$$\mathrm{ApEn}(m,r) = \lim_{N\to\infty}[\Phi_m^N(r) - \Phi_{m+1}^N(r)]$$

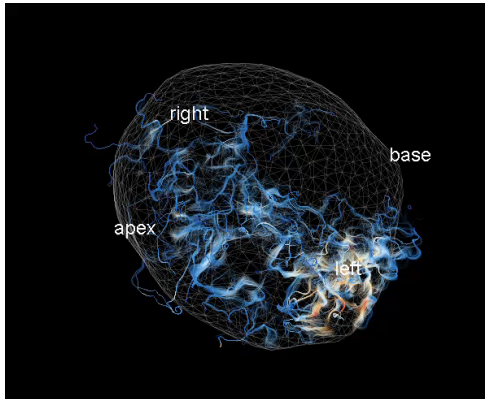
$$\mathrm{ApEn}(m,r,N) = \Phi_m^N(r) - \Phi_{m+1}^N(r)$$



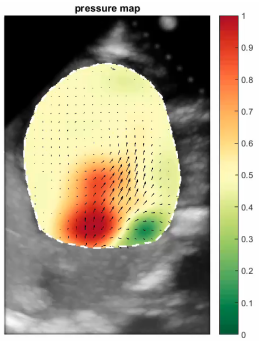


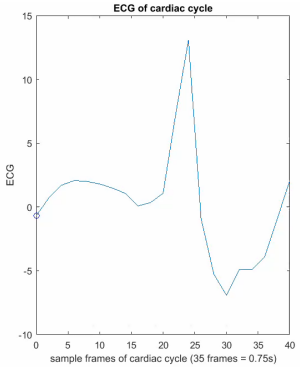
Research areas

Oncology



Cardiovascular





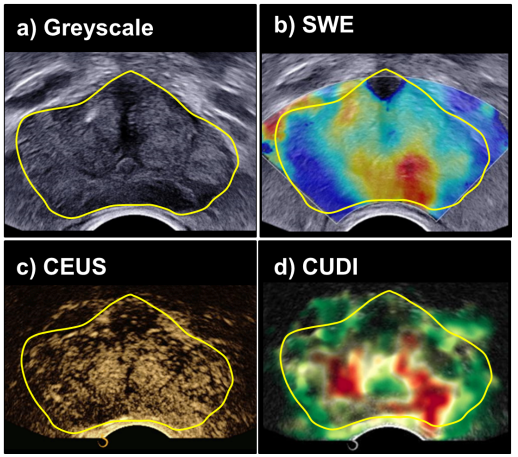
Neuromuscular

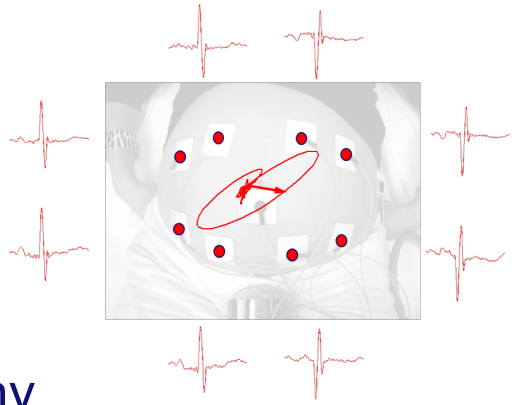
Sleep

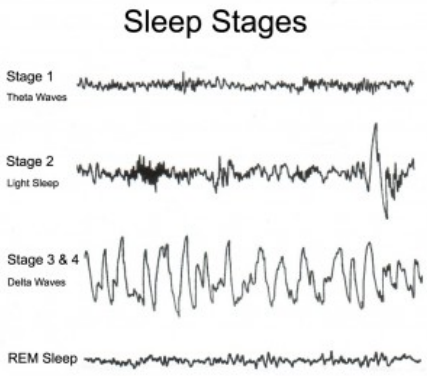
Pregnancy/perinatology

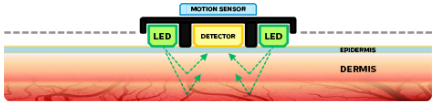
Measurement modalities

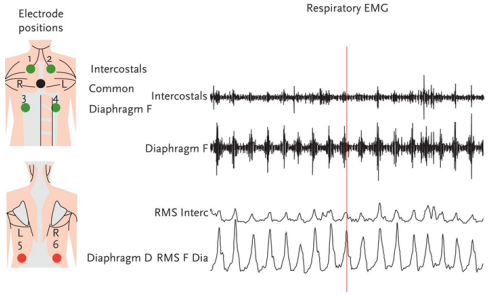
- Ultrasound
- Magnetic Resonance Imaging
- Electrocardiography
- Electrohysterography
- Electromyography
- Electroencephalography
- Photoplethysmography











Thank you!

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